financial incentive payments will discourage CLECs from reporting problems quickly to the ILEC.

Discourage CLEC Investment. CLECs will have a disincentive to introduce or improve their own systems to the extent they view the financial incentives system as placing BA-NY at a material competitive disadvantage. In addition, CLECs may come to rely on BA-NY's payment of financial incentives as a source of revenues, which again will discourage them from investing in their own systems. By making these investments, the CLEC loses the payments from financial incentives that may have become a material source of revenue. The financial incentives system must be designed with a careful consideration that it does not inadvertently discourage facilities-based entry or innovation by new entrants.

Delay or Distort Systems and Technologies. CLECs may oppose enhancement of BA-NY's systems or technologies if those changes are outside the guidelines and incentives process.

Deliberately Engage in Behavior Causing BA-NY not to Comply. In order to collect an incentive payment, a CLEC might choose customers that are especially difficult for BA-NY to provision or present service requests in a manner designed to cause delays in BA-NY's implementation.

Encourage Bounty Hunting and Inefficient Entry. If CLECs receive the incentive payments, this new revenue source will encourage inefficient entry. Firms that could not compete simply by producing telecommunications services will enter the market to obtain part of the bounty on errors the ILEC may make. CLECs also will be encouraged to engage in "bounty-hunting" activities. That is, CLECs may find it profitable to focus on requesting services in such a way, or services that are particularly difficult to provide, that they would be assured of earning a reward for likely noncompliance.

D. The Monetary Payments Called For By The PAP Are More Than Sufficient.

6. BA-NY's intrastate revenue including intraLATA toll in 1998 was $4.9 billion and its *profit* from local service was $495 million.[4] It is important to note that the $495 million in profits are from *all* of BA-NY's local customers. The PAP subjects BA-NY to annual payments totaling $269 million. This amount is more than 50 percent of its total intrastate profit from local service. AT&T, MCI, the New York Attorney General, and others claim that this amount is insufficient and have suggested that the entire amount of intrastate profits or more be put at risk under the PAP. This is not correct and is not supported by any analysis on the record.

III. FORD AND JACKSON REBUTTAL

7. MCI WorldCom's economists, Drs. George S. Ford and John D. Jackson, maintain that BA-NY's proposed annual bill credits of roughly $270 million are not large enough.[5] They base their claim on their estimate of BA-NY's financial gain from discrimination in the local market as being nearly $400 million.[6] Further, they suggest that difficulty of detection, which they assume to be about 50 percent, should increase the remedy figure to over $700 million.[7] As detailed below, their analysis includes numerous errors. However, when the errors in Ford and Jackson's assumptions and their methodological mistakes are corrected, their analysis actually supports BA-NY's PAP.

8. MCI WorldCom's economists have erred in their analysis of an optimal incentive penalty program.[8] A proper incentive program needs to impose sufficient penalties so that BA-

[4] *See*, Comments of Eliot Spitzer, Attorney General of the State of New York, at 30, n. 78 (*citing* Attachment 1, pp. 3-9 to BA-NY's July 22, 1999 *Performance Regulatory Plan Year 3 Annual Filing Revisions* in NY PSC Case 92-C-0665, *Proceeding on Motion of the Commission to Investigate Performance-Based Incentive Regulatory Plans for New York Telephone Company, Track 2*) (the "NY AG").

[5] *See* Comments of MCI WorldCom, Inc. on the Application by Bell Atlantic-New York for Authorization to Provide In-Region, InterLATA Service in New York ("MCI Comments"), CC Docket No. 99-295, Appendix, Tab C, Joint Declaration of Dr. George S. Ford and Dr. John D. Jackson on Behalf of MCI WorldCom, dated October 19, 1999, at ¶ 24 ("Ford and Jackson").

[6] *Id.* at ¶ 52.

[7] *Id.* at ¶ 85.

[8] Ford and Jackson assert that their analysis is based on the principles established by Gary Becker, a noted

NY will have lower profits (i.e., earn a negative incremental profit) if it reduces service quality below parity. The structure of the incentive payments are based mainly on: 1) the marginal benefit BA-NY receives from retaining a customer or a set of customers that otherwise would have switched to a CLEC; and 2) the change in the probability of being identified as non-compliant, which results from that deviation from parity. Ford and Jackson base their analysis on the total change in profits and the average probability of detection.

A. Marginal, Average, Or Total Profits—Which Is Correct?

9. A proper incentive program needs to impose penalties so that BA-NY will have lower profits (i.e., earn a negative *incremental* profit) if it reduces service quality below parity. The structure of such an incentive payment has three components:

- The marginal benefit BA-NY receives from retaining a customer that otherwise would have switched to a CLEC as a result of a one-unit deviation from parity;
- The incremental customer retention for a one period deviation from parity; and
- The change in the probability of being identified as non-compliant, which results from a one-unit deviation from parity.

Specifically, the optimal incentive for each measure and sub-measure is contained in the following formula:

$$A = \frac{\text{(ILEC Margin) * (\# ILEC Customers Retained for a Small Deviation from Parity}}{\text{Increase in the Probability of Detection for a Small Deviation from Parity}}$$

10. Ford and Jackson make three fundamental mistakes in attempting to set forth their "optimal penalty." First, their Equation (2) uses the "discounted present value of the future stream of profits attained through discriminatory conduct"[9] as the numerator and "the probability of detection"[10] as the denominator. Second, they assume that BA-NY only needs to discriminate

economist on crime and punishment (*see* n. 8 of the Declaration). As described below, clearly it is not.

[9] Ford and Jackson at ¶ 17.

[10] *Id.*

once to enjoy years of retained profits. Third, they err in claiming that it is desirable to have penalties that are too high. These errors cause Ford and Jackson to overestimate the appropriate incentive payment level. When corrected, their analysis actually supports BA-NY's Plan.

11. First, in Ford and Jackson's Equation (2), the numerator should be the Net Present Value ("NPV") of profits for a one-unit deviation from parity, while the denominator should be the *increased* probability of detection for a one-unit deviation from parity.[11] Ford and Jackson base Table 1, where they provide their examples of "optimal" monthly fines, on their Equation (2).[12] However, the ranges of numbers, which are applied to the equation, are both arbitrary and unrealistic. Moreover, the application of Equation (2) demonstrates exactly why this equation is incorrect. Nowhere in Ford and Jackson's Equation (2) is the size of the disparity in service (or the resulting degree of "harm" to CLECs) considered in relation to the marginal probability of detection and punishment. Further, the application assumes that *any* "discrimination" results in CLECs losing customers to the ILEC forever. This is not reasonable and is not borne out by any supporting data.

12. As has been discussed previously, an appropriate incentives scheme recognizes a direct relationship between the size of the harm (in this case, the size of the service disparity), the expected penalty, and the probability of detection. That is, we expect that large disparities will be detected more readily than small disparities. This can be observed in the BA-NY PAP where the power of the tests used (the probability of detecting a disparity when one actually exists) and the severity of the penalty increase as the size of the disparity increases.[13]

13. Ford and Jackson's contention that the BA-NY plan is inconsistent with an effective enforcement plan is wrong. They imply (at ¶ 45) that BA-NY's Plan somehow fails to remove the full financial reward resulting from service to CLECs at less than parity. This statement is wrong and follows from Ford and Jackson's fundamental confusion between

[11] *See* the attached Appendix.
[12] Ford and Jackson at ¶ 18.
[13] The probability of detection in the BA-NY Plan is reflected in the statistical test that compares the LCUG Z to a predetermined critical value.

average and marginal effects. In focusing on the *incremental* reward, which increases as the distance from parity increases, BA-NY's Plan ensures that the appropriate amount is extracted for deviations from parity, and that payment increases as the severity of the deviation increases. In addition, Ford and Jackson contend that the BA-NY PAP does not consider the probability of detection, which also is incorrect. Ford and Jackson's model is wrong in that it uses a constant, total probability of detection as opposed to the marginal probability, where the probability of detection increases with the size of the disparity. Further, it also fails to recognize that marginal probabilities are reflected in the penalty structure of the BA-NY Plan. While the probability of detection is not made explicit as a variable in the BA-NY Plan, the distribution of penalties proposed by BA-NY implicitly accounts for this probability because BA-NY relies on the modified Z statistic.

14. Second, Ford and Jackson's assumption that BA-NY will enjoy years of intertemporal benefits (or profit) infers that BA-NY only needs to discriminate once to lock in customers for years to come. This also assumes that BA-NY's benefits do not decrease in size over the years, although there is no additional discrimination. This assumption is simply wrong. The PAP is designed to be implemented month by month, over time. BA-NY will be subject to incentives arising from the PAP over continuous time periods, not just in the first period in which discrimination might occur. A proper incentive scheme must be designed to remove the increase in marginal profit that BA-NY enjoys as a result of a marginal change in service quality provided to CLECs (thus retaining more customers on the margin). Accordingly, the appropriate fine or penalty should be designed to extract the *incremental reward* from non-compliance. Ford and Jackson have maintained that a one-unit change beginning at zero makes the total, average, and marginal profit one and the same. Then they argue that total, average, and marginal probabilities of detection are identical.[14] While their statement is fundamentally true, the notion

[14] *See* Ford and Jackson at ¶¶ 80-81.

is simplistic and ignores that a proper incentive plan is designed to assure compliance for years to come.

15. The ILECs and the CLECs, as well as regulators, need time to learn and adapt to the new environment and behave in the optimal way. Any payment based on either the average or the total benefits BA-NY may gain over long periods of time would be patently flawed and arbitrary, which is what Ford and Jackson's equation produces. Instead, the payment should be based on accepted economic theory using marginal analysis. When sizing the appropriate economic penalties, the marginal or *incremental* profits that BA-NY would retain should be the target.

16. Finally, Ford and Jackson claim (at ¶ 23) that, to ensure the level of penalties is not too low, an arbitrary 1.5 "inflation" factor should be applied to increase the estimated penalty amounts by 50 percent. Again, they are wrong because they confuse averages with margins. The PAP does not create a situation, as implied by Ford and Jackson, where a miss is as good as a mile or where an infinitesimal degree of violation is just as severe as an infinitely large one. As a point of fact, any penalty will have the effect of moving BA-NY closer to parity. The correct margin-based statement is that an incentive payment that is too low will still engender some compliance. The closer the payment is to optimal, the closer the disparity will be to zero. "Erring on the high side" could have more damaging effects in the competitive telecommunications market than setting the level of incentive payments somewhat too low. In any event, as I explain below, since there is no danger that the incentive amounts in BA-NY's PAP are too low, there is no need to impose any arbitrary "inflation" factor on them.

B. Total Does Not Equal Marginal Does Not Equal Average.

17. The reasonableness of the level of payments arising from the PAP can be validated by inspecting the total annual profits earned by BA-NY from its local service revenues. The New York State Attorney General, for example, opines that "[t]he revenues that Bell Atlantic risks by opening its local service territory to competition are at least its net local market

revenues of $495 million."[15] The NY PSC was careful not to put at stake 100 percent of BA-NY's local service profits. It is the *incremental* loss in BA-NY's customer base that should be put at risk. That is, approximately 30 percent over 10 years in a scenario similar to AT&T's market share erosion after divestiture—a number Ford and Jackson also support (at ¶ 21).

18. The market landscape is rapidly changing as new technologies replace the old ones. The preferences of consumers also are rapidly changing as new products relating to the Internet, wireless, and other innovative technologies are gaining a bigger foothold. The CLECs deserve a fair chance to gain access to the ILECs' networks, but not at the expense of the economic efficiency of BA-NY. If BA-NY is subjected to arbitrarily high penalties, the CLECs' entry into the local telecommunications market would create a large social cost and, in fact, deter CLECs from innovating and operating efficiently. As a result, such an incentive scheme would actually *prevent* the beneficial effects commonly expected from a competitive marketplace. Moreover, the CLECs would have less incentive to cooperate and more reason to make unreasonable demands on BA-NY, thus forcing BA-NY to incur economic inefficiencies in order to meet these unreasonable demands. There is no consumer or societal benefit from such inefficient investments.

C. BA-NY's PAP Sets Appropriate Monetary Remedies.

19. As noted above, Ford and Jackson make a number of fundamental errors in their analysis. Examining the specific effect of those errors on their proposed payment scheme demonstrates that BA-NY's PAP sets appropriate monetary remedies. In their affidavit, Ford and Jackson attempt (at ¶ 24) to illustrate that the BA-NY Plan to allocate a maximum of $269 million per year in bill credits to the CLECs is inadequate to deter discrimination. In Table 3 (*Id.*, ¶ 49), Ford and Jackson present a schedule of "Optimal Fines" that range from $381 million

[15] NY AG, p. 31 (footnote omitted). *See also* note 4, *supra.*

to $3.811 billion. This analysis is based a 10-year horizon of extra profits as a result of discriminating against CLECs.

20. There are many incorrect assumptions and logical errors in this analysis. First, their example of optimal fines under different probabilities of detection includes a probability of detection as low as 10 percent for substantial violations—ones unlikely to go undetected. Under the Z score recommended in the BA-NY PAP, the probability of detection is certainly higher – probably in the 90 percent and above range for such obvious violations. Second, their example assumes a 10-year horizon for BA-NY's profits captured by discriminating against CLECs in the *first year*—and no discrimination thereafter. The assumption of one-year's discrimination leading to 10 years of increased profits is incredible.[16] BA-NY would have to systematically, and continuously over time, discriminate against the CLECs to retain its customers for a short period of time, let alone 10 years.

21. Ford and Jackson ignore any customer churn—an accepted fact of the telecommunications business. In businesses similar to the CLEC business; e.g., virtual private lines, Internet service subscription, and wireless communications, very high churn rates are common. My understanding of the industry suggests a 2 percent per month churn rate in the CLEC market would not be surprising. Even in the wireline market, annual churn rates of 20-30 percent, particularly for businesses, simply due to moving and going out of business are not unheard of. As the NY PSC notes, MCI WorldCom and AT&T "both assume that poor performance in one year will result in ongoing benefits for at least ten years. It has not been demonstrated that poor service in one year that is corrected would cause irreversible and cumulative damage in the following years."[17] The idea that a new CLEC would be able to maintain all of its customers for 10 years in the absence of ILEC discrimination is not credible.

[16] The NY PSC also notes that this methodology is flawed. *See* NY PSC Order at 18.
[17] *See* NY PSC Order at 18.

22. In Table 3, Ford and Jackson present results that suggest that a penalty of $423 million is appropriate in the case of a 90 percent probability of detection. This penalty represents their estimate of the net present value of a 10-year stream of additional profits resulting from a single instance of discrimination by BA-NY against a CLEC. However, I find that many of the assumptions built in to this calculation are flawed. If this amount is adjusted for just one of these erroneous assumptions, Ford and Jackson's model supports a figure that is actually *less* than BA-NY PAP's annual maximum of approximately $269 million in bill credits paid to CLECs.

23. To examine the magnitude of the effect of flawed assumptions on Ford and Jackson's results, I replicated their formulaic model. I then adjusted the assumption as to how long an instance of discrimination today would reverberate into the future to sustain customer loss by a CLEC. I also assumed that the effects of discrimination today would last three years, not 10 years as assumed in Ford and Jackson's model.[18] This single change has the effect of reducing the estimated $423 million penalty to $218 million. In essence, the results of my replication of Ford and Jackson's analysis suggest that even BA-NY's PAP may go too far in exposing BA-NY to penalties that are too high. Instead of proposing a theoretically sound penalty system, Ford and Jackson appear to be advocating a system of Draconian penalties based on erroneous and unrealistic assumptions and not related to any sound theory of economic incentives.

D. Aggregation Does Not Mask Discrimination.

24. Ford and Jackson (at ¶¶ 28-30) assert that violations in certain critical measures of the BA-NY Plan will preclude BA-NY from paying penalties on other measures—thereby giving BA-NY the opportunity to selectively reduce potential total penalties owed to a CLEC. This supposition is a canard. Profits realized by BA-NY from violation of the lead metric in a "chain of services" include the profits realized from links further down the chain, as they directly relate

[18] Indeed, my experience suggests that three years may still overstate the amount of time that customers are likely to stay with any given provider.

to the initial metric. As the NY PSC recognized, "[m]any metrics are interrelated, in that poor performance shows up in a number of metrics. Targeting one metric without affecting another would be extremely difficult."[19] In addition, "[t]he domain clustering rule provides significant protection. It provides disincentives to selectively target a function in order to hinder competition."[20] Using Ford and Jackson's example, if BA-NY fails to honor a CLEC order for Unbundled Network Elements ("UNEs"), the benefit to BA-NY incorporates benefits from all related downstream metrics as well. Accordingly, the penalties levied on BA-NY account for related metrics.

25. The aggregation of performance scores is not only effective for calculating penalties and discouraging sub-standard performance from BA-NY, it is necessary for demonstrating the value of each metric and relating penalties to their cause. By weighting the performance scores of each metric according to its importance, the BA-NY PAP assures that each violation is appropriately included in the total bill credits owed. As for any alleged failure of the PAP to account for extreme magnitudes of violation,[21] it is unreasonable to require the PAP to consider every possible degree of service rendered. To do so would invalidate the PAP's goal to establish general guidelines for evaluating performance to all CLECs. Some aggregation is necessary. Moreover, the effect of a deviation from parity in any metric must be determined in a straightforward manner.

26. Detection of violations is not impeded by aggregation of performance scores (*see* Ford and Jackson at ¶ 30). By providing each CLEC with a monthly statement of performance in each metric, BA-NY is owning up to its failings and not attempting to hide sub-standard results among parity measurements. Increasing fines above a reasonable level therefore is not necessary to ensure compliance, since any observer can plainly see where BA-NY provides equal or sub-standard service on a metric.

[19] *See* NY PSC Order at 15.
[20] *Id.* at 20.
[21] *See* Ford and Jackson at ¶ 86.

27. Ford and Jackson's concern (at ¶ 31) about the treatment of CLECs as a single entity is not a potential problem. Aggregation of all CLEC data is used in evaluating MOE measures and determining whether all CLECs are eligible for bill credits. For the MOE standards, bill credits are allocated according to the size of the CLEC relative to the industry. This aggregation actually works to the advantage of the CLECs. For example, sometimes a CLEC's individual performance scores will not merit bill credits but the performance for CLECs in the aggregate will entitle it to receive credits based on its share of qualified lines in service. For critical measures, both an aggregate and an individual rule apply. Even when the aggregate rule does not apply, the individual rule for calculating critical measure penalties does consider CLECs with continual sub-standard service from BA-NY and credits those CLECs separately.

E. BA-NY's Plan Appropriately Accounts For The Probability Of Detection.

28. Ford and Jackson assert (at ¶ 34) that the PAP's upper bound on detection and punishment would be 50 percent. This estimate is completely without support of any kind. In fact, the NY PSC states that a 50 percent probability of detection is "an unlikely circumstance."[22] Ford and Jackson admit that the Z-values determine the probability of detection. Without any support and due to what they consider the "complexities" of measuring performance, Ford and Jackson assume that 50 percent is the upper-bound probability on detection and punishment. This is unrealistically low. Using the LCUG Z statistic, the probability of detection is determined (at least in part) by the size of the disparity. We would expect a high probability for a large disparity and a low probability for a small disparity. In fact, for large disparities, the probability of detection is nearly 100 percent, not 50 percent. As noted, BA-NY will provide the CLECs with monthly reports. Thus, BA-NY's performance will be subject to scrutiny not just

[22] NY PSC Order at 18.

by the NY PSC but also by the CLECs, most of which are significant and sophisticated business organizations.

29. In their estimation of BA-NY's reward for discriminating against CLECs, Ford and Jackson made several computational errors. They assumed a 20 percent gross profit margin per line without factoring in additional costs. Ford and Jackson advocate (at ¶ 23) using their inflated profits estimate as the penalty benchmark and, in addition, applying a completely arbitrary multiple of 1.5 to "ensure the fines are adequately severe." Again, I stress that devising a proper incentive scheme should be based on a theoretically sound methodology, and not an *ad hoc* procedure that leads to certain and seriously deleterious consequences on the efficiency, competition, and the welfare of the public.[23]

30. Ford and Jackson's statement (at ¶ 37) that the size of the fine should increase along with the LCUG Z score is not consistent with incentives theory or with Ford and Jackson's own arguments. If we consider Ford and Jackson's Equation (2), we see that the size of the punishment should decrease as the probability of detection increases. However, if the LCUG Z is used to determine the size of the penalty, exactly the opposite is true—if the Z score increases, the likelihood of punishment increases, but the fine goes up not down. Ford and Jackson's application thus violates the very theory upon which it supposedly is based.

F. Type I Errors Do Not Equal Type II Errors.

31. In addition, Ford and Jackson state (at ¶ 42) that "[g]enerally, we do not know the exact value of the probability of a Type II error, because it depends on the unknown value of the true means difference. But it is sensible to suggest that it is *at least equal* to the probability of a type I error." This statement has no basis in fact. There is no logical reason to believe and no research to suggest that these probabilities should be "at least equal." In fact, consider the case where the system is so stringent that the probability of a Type II error is almost zero. In this

[23] In the attached Appendix, I provide a more theoretical discussion of service quality incentive plans.

case, the Type I error would be close to one; i.e., we are in a regime that convicts everyone. Conversely, consider a very "loose" regime under which the probability of a Type I error is close to zero; i.e., we are in a regime that convicts almost no one. In this case, the Type II error will be close to one. These extreme examples, along with the fact that Type I and Type II errors move in opposite directions (i.e., an increase in Type I leads to a decrease in Type II and vice versa), demonstrate that Ford and Jackson's statement about the relative sizes of Type I and Type II errors is not founded on fact. The NY PSC also notes that the argument "that type 1 and type 2 errors should be balanced fails to recognize that the minus one score cutoff levels of the plan provide added protection against type 2 error. . . . To reasonably figure out how these error types balance, it would be necessary to know the average degree to which parity was not provided. However, if this information existed, there would be no need to do a test for lack of parity."[24] For more than 50 years, professional statistical theory and practice have minimized the probability of a Type II error subject to accepting a small Type I error, rather than equating them. Thus, the canon of statistical practice stands against Ford and Jackson.

IV. AT&T'S ANALYSIS IS INCORRECT REGARDING BA-NY'S PAP.

A. The Amount At Risk Under The PAP Is Sufficient

32. AT&T suggests (at 89) that the Plan has insufficient monetary consequences because the maximum cap is subdivided into too many sub-caps. Further, they contend that it is limited by not having enough metrics (at 91), that weighting and aggregation bury bad performances and allows BA-NY to engage in targeted discrimination without consequences, and poor performance in one period can be canceled by adequate performance in subsequent periods (at 92).

[24] NY PSC Order at 17.

33. AT&T's contention (at 87) that penalties proposed by BA-NY are insufficient is based on the outrageous claim that BA-NY's "excess profits" from providing disparate service to the CLECs could be in the billions. This statement assumes that BA-NY is destined to lose 100 percent of its customers to competitors. It also confuses revenues, which are in the billions, with profits that are in the millions. Such assertions are extreme and misleading and serve only to distort the perception of what is really at stake for BA-NY. BA-NY is faced with losing a much smaller percentage of its customers, perhaps 30 percent over a ten-year period, similar to the experience of AT&T during 1984 to 1994.

34. AT&T's argument that sub-caps reduce BA-NY's exposure is misdirected. The sub-caps are nothing more than estimates of the incremental profit that could be obtained from retaining customers for a deviation from parity of a metric associated with the sub-cap. The relevant question, as discussed previously, is whether the payment is of a size to take away the incremental profit from the alleged disparity. I believe it does. To understand the logic behind the sub-cap methodology, consider the following. During the course of a year, the maximum payment BA-NY should make is equal to the NPV of profits it could have retained by discriminating throughout the year. In a single month, the expected profit would be roughly 1/12 of the annual expected retained profit. Similarly within a month, the expected profit would be a fraction of the 1/12 for each sub-metric. This fraction would depend on the number of customers (i.e., the economic relevance) of the sub-metric as measured by the weight. Thus, the structure is designed to mimic to a high degree of approximation the structure of an optimal incentive plan. Since AT&T and MCI WorldCom raise the same issues, I refer the reader to my discussion of MCI WorldCom's issues above.

B. Aggregation Likely Will Lessen Variance, Not Increase It.

35. All parties agree that some aggregation is necessary to make performance evaluation manageable. C. Michael Pfau and Michael Kalb, in their affidavit filed on behalf of AT&T, contend that BA-NY's measures are not accurately disaggregated and that this leads to

an increase in the ILEC variance which is used to compute the Z-score. Indeed, it is possible that aggregation will affect variance. However, the likely effect of aggregation will be to *lessen* variance, not to increase it. One reason for this is that variance decreases as sample size increases. Accordingly, the reduction in variance would lead to an increase in the Z-score since the smaller variance enables us to detect deviations from parity with more certainty. As discussed in my rebuttal of MCI witnesses Ford and Jackson, aggregation increases the probability of detection—it does *not* decrease it.

C. A Balanced Risk Approach Is Not Correct.

36. Pfau and Kalb follow the same flawed reasoning as MCI witnesses Ford and Jackson in stating that there should be equalization of Type I and Type II errors. Type I errors do not equal Type II errors. As stated above, statistical tests are designed to minimize the probability of a Type II error subject to accepting a small Type I error. All tests in use today are based on this approach. Statistical tests, in general, are not designed to equate Type I and Type II errors. Both Pfau and Kalb and Ford and Jackson recommend something entirely different from accepted methodology.

37. In addition, Pfau and Kalb ignore the fact that it is not possible to preselect a single value for the Type II error. While AT&T has supposedly conducted some study that yielded "at least a 15% probability" of a Type II error associated with a 5 percent probability of a Type I error, this study has never been produced for inspection. Even if the calculation was valid, it is only pertinent to the specific observations used in the AT&T analysis. Use of another data set might result in a much smaller (or conversely, much larger) value for a Type II error. AT&T is trying to mislead the Commission that there is some trade-off that can be affected. While it is true that Type I errors tend to decrease as Type II increases, AT&T's calculation of 15 percent says *nothing* about what the likely size would be of a Type II error for a different disparity found in another data set. In other words, it is possible that another sample would turn up a different result for a Type II error and that might be even less than the Type I error of 5

percent. AT&T presents "one analysis out of a million" which just happens to give the result it wants.

38. Thus, the Type II error is not just "one" number associated with any value for a Type I error. The Type II error can conceivably take on any value between 0 and 100 percent, depending on the size of the disparity (that is, we can calculate the Type II error for a given disparity, but it will vary over different values of the disparity). This fact also conforms to logic, as described above. For very small disparities, we would expect a larger Type II error since discrimination might be harder to detect. However, as the size of the disparity increases, we are increasingly likely to identify the discrimination correctly. In the limit, for very large differences, we would approach 100 percent certainty that we would properly identify the disparity as significant.

D. Poor Performance Is Not "Canceled Out."

39. Pfau and Kalb also state that "poor performance in one period can be canceled out by adequate performance in subsequent periods." This statement demonstrates that the AT&T witnesses do not understand the purpose or the effect of allowing performance scores of –1 to be changed to 0 when the score is 0 in the two subsequent periods. In order for a performance score of –1 to be attained, the LCUG Z must be less than a critical value of only –0.8225. This critical value is associated with a 15 percent probability of a Type I error, which is unusually high for statistical tests. Accordingly, the purpose of the 3-month performance score review is to ensure that disparities are real and not illusory. The comparison with performance scores in the two subsequent months provides this check. When a performance score is changed from –1 to 0, it is because the data from subsequent months suggest that the disparity that led to a –1 was based on a test with a rather high probability of finding discrimination when none existed (a Type I error). Thus, its results are less than certain. It does *not* allow BA-NY to "cancel out poor performance" nor does it build in an allowance for poor performance on the part of BA-NY. MCI's economists

claim that "allowable misses let the RBOC discriminate without consequence . . .."[25] The "misses" they are worried about are not of a size that any statistician would consider "misses." That is, what they refer to as a miss is a deviation that is statistically insignificant; i.e., it cannot with any clear certainty be taken as an indication of disparity. If there is a statistically insignificant disparity—one that probably is the result of random error—the PAP allows that it *might* be an indication of true disparity as opposed to rejecting it outright as it should. Further, the PAP then uses the outcomes in succeeding months to determine if the disparity was indeed real.

E. Delayed Payments Benefit The CLECs.

40. Pfau and Kalb also contend that BA-NY's Plan includes substantial and unnecessary delays in the appearance of CLEC bill credits. In fact, it is exactly these checks over time which allows the BA-NY Plan to differentiate between one-time (or sporadic) and consistent month-to-month discrimination. The BA-NY Plan correctly accounts for the fact that systematic discrimination by BA-NY over time will be of greater detriment to the CLECs than one-time instances. The provision of double bill credits for inadequate service in three consecutive months is there to ensure that CLECs receive increased levels of compensation for ongoing discrimination. These data "delays" thus are actually in the CLECs best interests.

41. It is interesting to note that Pfau and Kalb provide no suggestions for an alternate system of timing for data collection, analysis, and the issuance of bill credits. There is no such system that can operate in "real time." It is not possible to provide credit to a CLEC immediately because monthly data are required to make a statistical determination of discrimination. The allowance that BA-NY has until the 25th of the month to report statistics for the prior month is absolutely reasonable, and is necessary to ensure the integrity of the data. As mentioned above, the ability of the PAP to look at performance in consecutive months will result

[25] *See* Ford and Jackson at ¶ 32.

in additional compensation to CLECs when it is determined that discrimination is ongoing and has not been remedied.

V. A FEDERAL PERFORMANCE ASSURANCE PLAN IS NOT APPROPRIATE

42. Allegiance asks the Commission "to impose anti-backsliding measures either through a rulemaking proceeding or by imposing conditions on its approval of a section 271 application." (Allegiance at 15.) Allegiance submitted an anti-backsliding petition to this Commission in February 1999.[26] It is not necessary for the Commission to institute federal measures. Allegiance does admit that this Commission could adopt "state commission-endorsed performance metrics that meet national minimum standards . . .." (*Id.*) BA-NY and the NY PSC have worked diligently to establish a PAP that specifically meets the requirements of the NY PSC. Other state commissions should have the same freedom to develop state-specific plans. It is not necessary to have federally mandated performance metrics. This would ignore marketplace realities in the different states. Properly developed state plans take away the margin. If the margin is taken away there is nothing else to do. The agencies that are best able to determine this are the ones closest to the firm—the state regulatory commissions. The margins that need to be taken away will differ based on the state as will the number of customers retained. Moreover, additional federal regulation would distort optimal incentives created by the states.

[26] *See* Development of a National Framework to Detect and Deter Backsliding to Ensure Continued Bell Operating Company Compliance with Section 271 of the Communications Act Once In-region InterLATA Relief Is Obtained, *Petition for Rulemaking*, RM-9474, dated February 1, 1999.

Technical Appendix

11/8/99

An Empirical Assessment of the Efficacy of the Bell Atlantic NY Incentive Payment Program

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INTRODUCTION

In order to determine whether the Bell Atlantic-New York ("BA-NY") Performance Assurance Plan ("PAP") provides sufficient monetary rewards for disparate service, I built a model that simulates the PAP and its associated rewards under different deviations from parity.[1] Models in which the response variable being described is inherently discrete are called Qualitative Response models (the response may be the result of data in a survey or a decision). A commonly used Qualitative Response model is a logit model in which the process being modeled is usually one of the discrete choices among a small set of alternatives. Thus, I chose to use a logit model—a qualitative dependent variable model estimator—for the analysis of BA-NY's PAP performance.

A SIMPLE LOGIT MODEL OF DEMAND.

In this model, m represents the margin for a retained customer. For this analysis, I assumed a churn rate of 3 percent per month and a monthly profit of $4.00 per line. I used a conservative cost of capital of 10.2 percent, and discounted over a 30-month period.[2] Under these assumptions, a typical line generates $72.49 in profits over its expected life. I assumed 11,900,000 (N) lines in service in BA-NY's territory. I also assumed a current market share for the CLEC industry of 5 percent. The profit for BA-NY is then given by $N*m*S_I$. At parity, this number is equal to $778 million over a 30-month period. I model the ILEC's market share, S_I, using a nested logit structure. That is, customers choose first whether to stay with the ILEC

[1] I did not model the PAP special provisions or any aspect of BA's Change Control Assurance Plan. Both of these serve to place additional amounts at risk for BA.

or move to a CLEC, and then choose which CLEC they prefer. This assumption has the advantage of allowing me to aggregate the CLECs and treat the CLEC segment of the market as though it was a single firm. This causes no loss in generality since I am not trying to model a customer's choice of a CLEC. I assume that customers choose their carrier based on a variety of criteria: price, the quality of services as measured by the metrics, and so on. Let $\boldsymbol{x_I}$ denote a list of non-service attributes of the ILEC's offering, and let $\boldsymbol{L_I}$ indicate the list of service quality indicators for the ILEC. We assume the utility of the representative consumer for the ILEC's service is:

$$U_I = x_I^T \beta + L_I^T \alpha$$

Whereas the representative utility for the CLEC service is:

$$\begin{aligned} U_C &= x_C^T \beta + L_C^T \alpha \\ &= x_C^T \beta + (1+\lambda) L_I^T \alpha \end{aligned}$$

where I have written the CLEC service quality measure as a proportion of the ILEC's. That is $L_C = (1+\lambda) L_I$ for each service quality measure in L. All this means is that I assume that if one measure is off by 50 percent, all measures are off by 50 percent. I do not investigate what happens if one measure is off by 50 percent and another off by 10 percent and another not at all. To do so requires market information that does not exist at this time. With these assumptions the ILEC market share can be written as:

[2] To be conservative, I assumed independence between time periods. An assumption of dependence would have resulted in a higher frequency of doubling provisions, thus resulting in higher expected penalties.

$$S_I = \frac{\exp\left(x_I^T \beta + L_I^T \alpha\right)}{\exp\left(x_I^T \beta + L_I^T \alpha\right) + \exp\left(x_C^T \beta + (1+\lambda) L_I^T \alpha\right)}.$$

Under the assumption that the non-service attributes of the respective competitors will not change, we can rewrite the model as

$$S_I = \frac{\exp(M_I)}{\exp(M_I) + \exp(M_C + \lambda\beta)}.$$

M_C and M_I are chosen so that at parity BA-NY has 95 percent of the market and the combined CLECs have 5 percent. To obtain this, we take $M_C = 0$ and $M_I = 3$. The coefficient β is chosen so that a 15 percent deviation from parity will be sufficient for BA-NY to drive all the CLECs from the market. A value of -10 is sufficient to do this. Thus BA-NY's profit is given by:

$$\$72.49 * 11{,}900{,}000 * \frac{1}{1 + \exp(3 - 20\lambda)}$$

This is a function only of λ, which I write as $\pi(\lambda)$.

A Monte Carlo Estimate of Payments

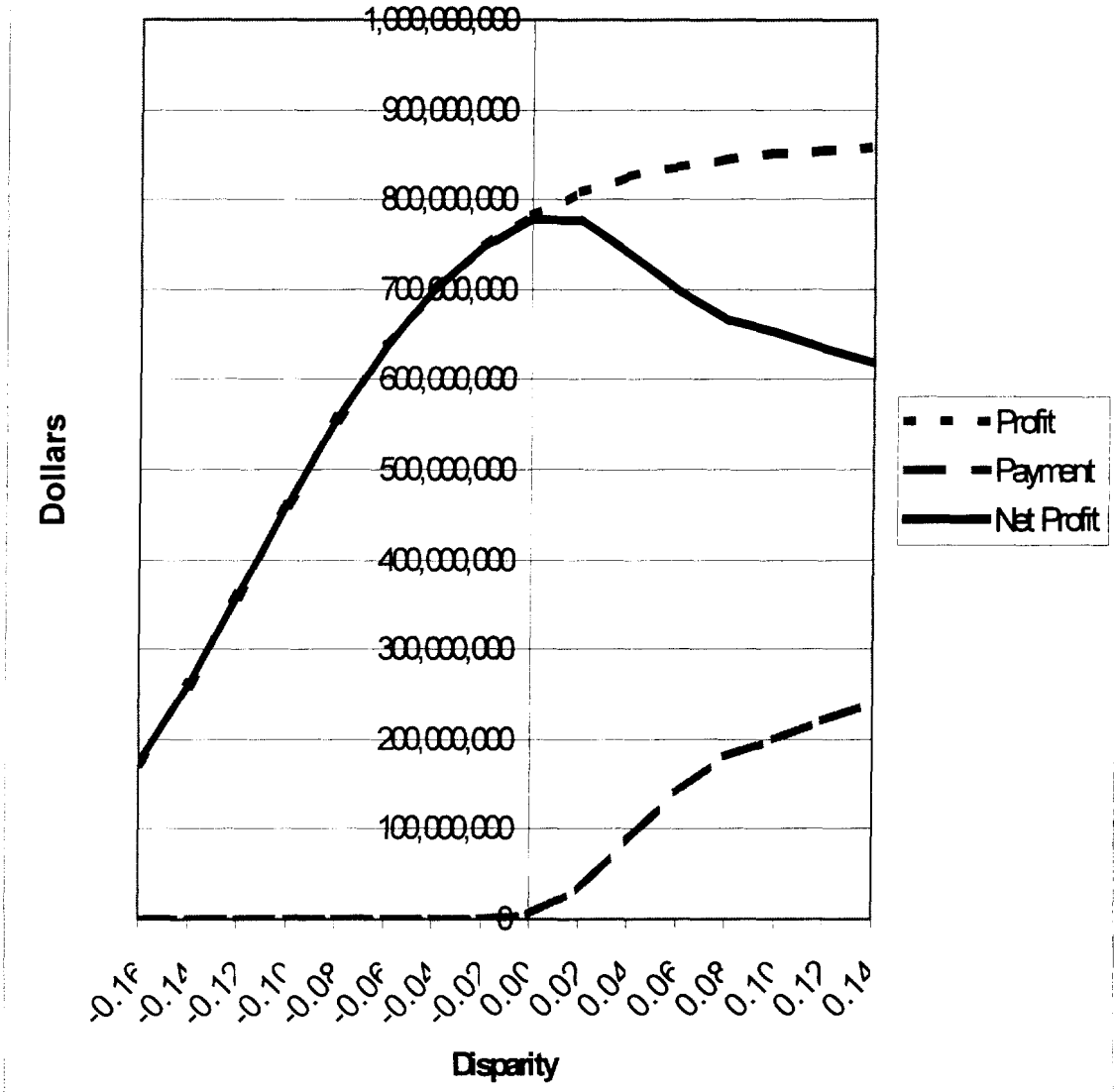
I simulated the payments for the BA-NY Plan using Monte Carlo methods. The BA-NY payment plan is a nonlinear multivariate function of the service quality measures. To judge its effectiveness we need the expected value of the payments at parity and for each deviation in

parity beyond zero. The Monte Carlo method is well suited to doing this. The Monte Carlo method is simply described. If $P(\theta) = \int p(x_1,\cdots,x_K;\theta) f(x_1,\cdots,x_K;\theta) dx_1 \cdots dx_K$ is the desired expectation, then an estimate of this is obtained by sampling from $f(x_1,\cdots,x_K;\theta)$ and evaluating the sample analog of $P(\theta)$, $\hat{P}(\theta) = \int p(x_1,\cdots,x_K;\theta) dF^*(x_1,\cdots,x_K;\theta) dx_1 \cdots dx_K$. Where F* is the simulation distribution of f. To do this I developed a computer simulation of the BA-NY payment plan. This is a computer program, which begins with various data and assumptions about households, businesses, BA-NY and the CLECs and simulates how they will interact in the future. Methods like these are used to simulate the performance of aircraft under design, military strategies, etc. The program is in Visual Basic for EXCEL and includes a few hundred lines of code. It runs on a Pentium II 450 Mhz platform using Windows NT 4.0.

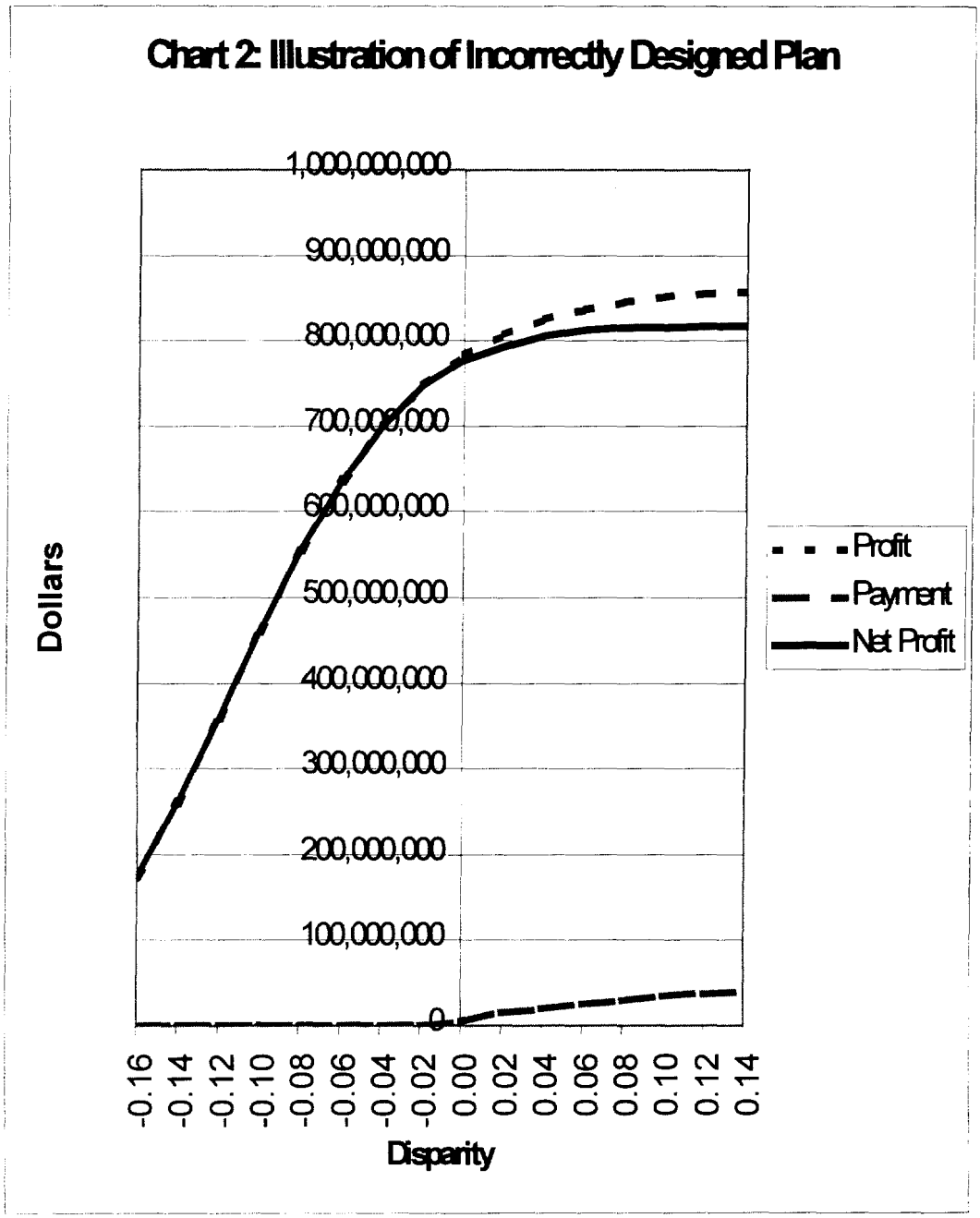
For each metric, I used BA-NY data for the mean service measure and the BA-NY volume. I used the aggregate CLEC information for volume and divided it into volumes for 18 hypothetical CLECs. For each metric, I determined the type of distribution likely to govern observations. For proportion data, I used the binomial. For error counts and rates, I used the Poisson; for service interval times and the like I assumed the exponential. To simulate payments at parity for each metric and firm, I took the BA-NY mean and the volume for each of the firms including BA-NY and simulated a mean performance score for all metrics. I then calculated Z scores, where appropriate, and calculated the payments. I did this for 14 consecutive months and used the first 12 months to obtain an annual payment. The payments at parity constitute an estimate of the magnitude of the Type I error. For the out of parity scenarios, I did the same thing for BA-NY but for the CLECs I gave an across the board

increase in the level of disparity to each CLEC for each month in each metric and then calculated the payments. For parity and each level of disparity, I performed this calculation a large number of times and averaged the results. Thus, the payment at parity is the Monte Carlo average of independent simulations and is an estimate of the expected value of the payment plan at parity. Similarly, the payment at each level of disparity is a Monte Carlo estimate of the expected value of the payment at that level of disparity. Consequently, I am able to estimate the expected total payments as a function of the same λ. I call this schedule $P(\lambda)$. The net profits of the firm are given by the difference between the two.

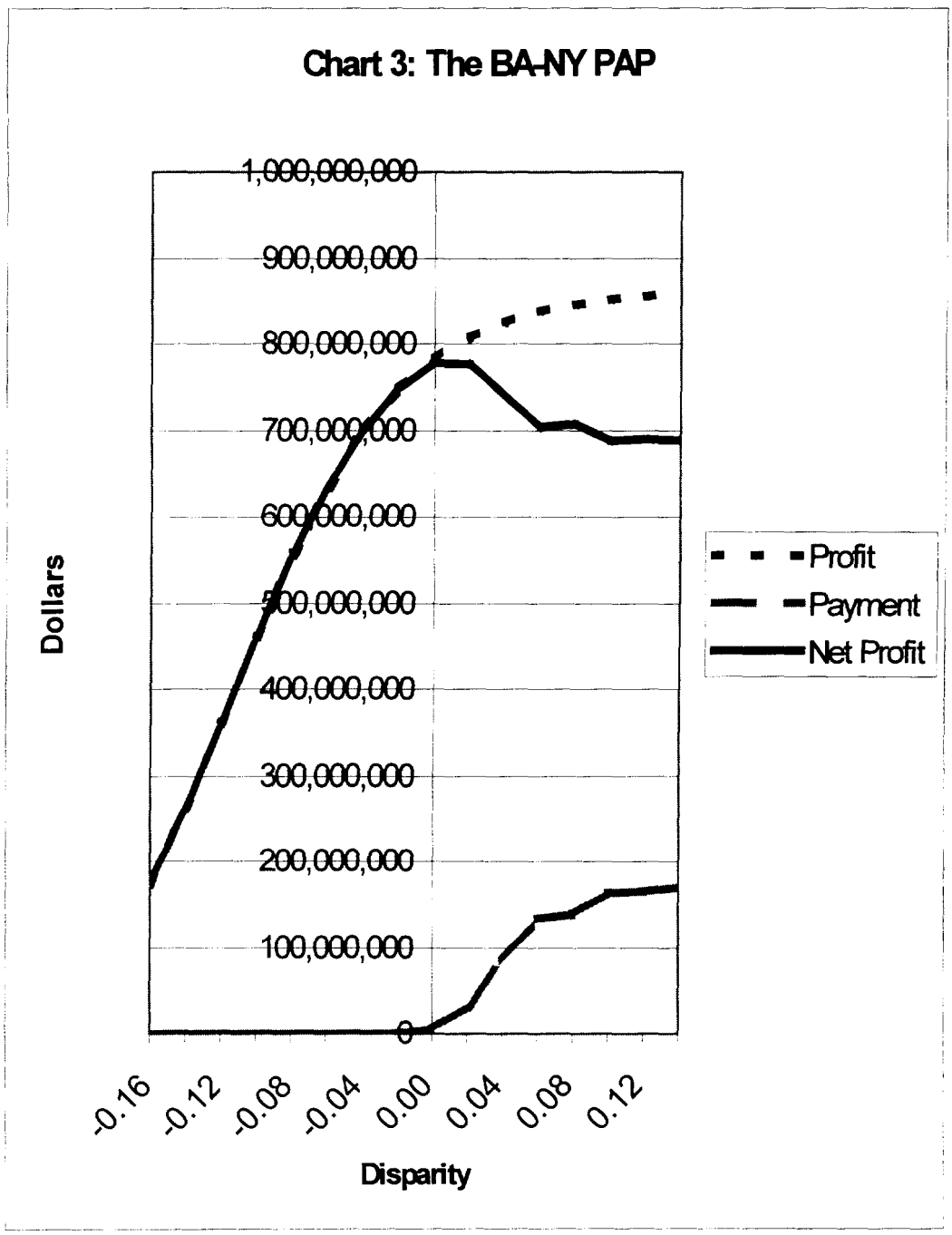
If the Bell Atlantic Plan is effective then the graph of the net profits against λ will have a maximum at $\lambda = 0$. It should look something like the graph in Chart 1. Note the white Net Profit line has an optimum at $\lambda = 0$. In contrast, an incorrectly constructed plan would look something like Chart 2. The optimum there is at .15. That is, it is structured to induce BA-NY to drive out its competitors by giving poor service. That BA-NY's PAP is correctly structured can be seen in Chart 3. It has an optimum at $\lambda = 0$.



NOTE: BA-NY's estimated 30-month profit at parity is $778 million.



NOTE: BA-NY's estimated 30-month profit at parity is $778 million.



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